

IN THE CLAIMS

Claims 1-8 are pending.

Claims 9-18 were previously withdrawn.

Claim 1 is currently amended.

1. (Currently amended) A middleware communication space enabling coordination of one or more distributed applications stored on computer readable storage media in a partially connected ad hoc wireless network, the middleware comprising:
a proxy component stored on computer readable storage media and configured to receive data from the one or more distributed applications;
a protocol agent stored on computer readable storage media and coupled to the proxy component, the protocol agent configured to monitor metadata for transport and to govern asynchronous transport of messages in the partially connected ad hoc network wherein the protocol agent connects to one network at a time; and
a metadata storage component stored on computer readable storage media and coupled to the proxy component and the protocol agent, the metadata storage component configured to store metadata capable of being transported as a message according to the one or more distributed applications, the middleware communication space providing an asynchronous bridge between two or more partially-connected networks, the bridge enabling temporary storage of the messages to enable transparent messaging between two or more devices[.];

a discovery component stored on computer readable storage media and coupled to the protocol agent to determine one or more neighbor devices according to a listen and announce protocol;

a choosing component stored on computer readable storage media and coupled to the discovery component to choose a neighbor device for receipt of one or more messages, the choosing comprising:

deriving a stochastic model of the dynamically changing topology;

using the stochastic model, evaluating routes for delivering the messages

according to the expected path length;

determining a shortest expected path route from the evaluated routes; and

delivering messages to another device to propagate messages between the networks.

2. (Original) The middleware communication space of claim 1 wherein the message is in one or more of a SOAP format and a WS series protocol format.
3. (Original) The middleware communication space of claim 1 wherein the middleware storage component holds a plurality of the messages in eXtended Markup Language (XML), the messages in a hierarchical structure.
4. (Original) The middleware communication space of claim 1 wherein the metadata includes: web service routing protocol (WS-Routing) data that defines routing data; and data appropriate for an extended protocol to provide processing information for the protocol agent.

5. (Original) The middleware communication space of claim 1 wherein the middleware communication space provides one or more of message caching, transferring and routing.

6. (Previously presented) The middleware communication space of claim 1 wherein the messages are organized into a plurality of data fields including at least one or more of:

an expiration time data field identifying the expiration of the message in absolute time such that data are invalid after the identified time;

a hop limitation data field providing an upper bound of hops that a message can be transferred, the upper bound decreasing by one after a successful transmission;

a timestamp data field providing a absolute time marking creation time of the message;

a namespace data field identifying a subspace in which the message is placed;

an administration domain data field identifying a domain to which the message is restricted, the administration domain data field defining a physical bound of devices which share a same administration privilege;

a relatedness data field specifying a topic to which the message is related, the relatedness providing a relationship attribute to define an action when two or more messages are related to the topic;

a priority data field defining a priority of the message; and

a property data field providing an extensible component for the distributed application to define application-specific properties with the message.

7. (Original) The middleware communication space of claim 6 wherein the messages are organized into at least three of the data fields.

8. (Original) The middleware communication space of claim 6 wherein the messages are organized into at least six of the data fields.

9. (Withdrawn) A method of communicating between a distributed application and a middleware component, the method comprising:
issuing a call having a length, the call identifying a message identifier and metadata, the call to remove the metadata from the middleware component; and
asynchronously receiving the metadata from the middleware component, the receiving via a virtual shared communication buffer located on one or more mobile devices, the receiving independent of the existence of a network connection between the mobile device and the distributed application.

10. (Withdrawn) A hierarchical application programming interface (API) embodied on one or more computer readable media, the application programming interface comprising:
a first set of APIs related to operations of a middleware communication space;
a second set of APIs related to event registration; and
a third set of APIs related to namespace operations, the hierarchical API enabling separation of basic operations of a middleware communication space from security

related operations in an environment that allows messaging between disconnected networks using a mobile device, the mobile device independent of simultaneous connection to the disconnected networks.

11. (Withdrawn) The hierarchical API of claim 10 wherein the first set of APIs includes:

a write function that provides for distributed applications to call a write to insert metadata into the middleware communication space;

a read function configured to read out metadata and removing data from the middleware communication space and remove data and leave the metadata unchanged; and

an enumerate and search function configured to enumerate metadata according to a template of selective criteria.

12. (Withdrawn) The hierarchical API of claim 10 wherein the second set of APIs includes APIs directed to registration and deregistration via a register function configured to register a handler of one or more events according to a template configured to filter according to type of event.

13. (Withdrawn) The hierarchical API of claim 10 wherein the third set of APIs in namespace operation APIs including:

a space export and import function to configure which (sub-)space should be shared with one or more devices; and

an enumerate sub-space function configured to provide that a sub-space in the middleware communication space can be enumerated according to a template that specifies the selective criteria that sub-spaces associated with the distributed application are to enumerate.

14. (Withdrawn) A computer readable medium comprising:
executable code adapted to perform a function responsive to a call from a component, the function comprising:

one or more operation parameters representing possible operations
performable by the component configured to affect a middleware communication
space;

one or more event parameters representing event registration for events related to
the middleware communication space; and

one or more namespace parameters representing security related operations within
the middleware communication space; and

executable code adapted to receive the operation parameters, event parameters and
namespace parameters and provide a middleware communication space enabling a
mobile device to act as a bridge between one or more disconnected networks transparent
to a distributed application.

15. (Withdrawn) A method for a mobile device to perform as a bridge between two
or more networks in a dynamically changing topology, the method comprising:

performing discovery to determine one or more neighbor devices according to a listen and announce protocol;

maintaining storage for metadata including storage for an expected path length;

choosing a neighbor device for receipt of one or more messages, the choosing

comprising:

deriving a stochastic model of the dynamically changing topology;

using the stochastic model, evaluating routes for delivering the messages

according to the expected path length;

determining a shortest expected path route from the evaluated routes using; and

delivering messages to another device to propagate messages between the networks.

16. (Withdrawn) The method of claim 15 wherein the mobile device is a node in the topology, the determining a stochastic model including assigning a probabilistic weight representing a probability of a connection between two nodes in the topology.

17. (Withdrawn) A computer readable medium having computer executable code thereon to perform acts that enable a mobile device to perform as a bridge between two or more networks in a dynamically changing topology, the acts comprising:

performing discovery to determine one or more neighbor devices according to a listen and announce protocol;

maintaining storage for metadata including storage for an expected path length;

choosing a neighbor device for receipt of one or more messages, the choosing

comprising:

deriving a stochastic model of the dynamically changing topology;
using the stochastic model, evaluating routes for delivering the messages
according to the expected path length;
determining a shortest expected path route from the evaluated routes using; and
delivering messages to another device to propagate messages between the networks.

18. (Withdrawn) The computer readable medium of claim 17 wherein the mobile device is a node in the topology, the determining a stochastic model including assigning a probabilistic weight representing a probability of a connection between two nodes in the topology.